



Citation X

When speed matters

Corporate aviation is about meeting the specific needs of the discerning customer.

It is about arriving in style, in comfort, and most importantly, in time. But for pilots, the great news is that Cessna's Citation X (X as in the Roman numeral for 10) also offers them first class service.

A PROUD HERITAGE

The swept wing jet with 'Citation X' emblazoned on its engine nacelles sits dominantly on the ramp at Essendon, the top of the line in the Citation family which has evolved remarkably from the small, straight winged business jet that first flew in 1969. Back then, the original Citation's short field performance was as impressive as its plush interior. While today's CJ series and the new Citation Mustang ably fill the entry-

level business jet category pioneered by their predecessor nearly four decades ago, the sophisticated, high speed Citation X operates in an altogether different segment of the corporate aviation market.

The Citation X first hit the drawing boards in 1990 and the first production prototype took to the skies four years later. It was awarded the Collier Trophy in its debut year for the advances it had made in aviation and aerospace technology. In 1996, the first proud owner of the type was golf champion Arnold Palmer, and today around 300 have been sold and over 1 million flight hours have been logged.

This is a transcontinental machine that edges the boundaries of the 'right stuff' with a cruising Mach number up to 0.92, a certified ceiling of 51,000ft and a range of over 3000nm. It stands tall with a pair of aft mounted engines that deliver nearly 13,500lb (60kN) of thrust between them. Notably, the cross section of the power-

plants has the same diameter as the fuselage of the original Citation 500. Weighing in with a max takeoff weight of 16,345kg this is an impressive aeroplane.

STANDING TALL

The aircraft for today's flight is the US registered Cessna demonstrator N712VP, and despite over 7000 hours on its airframe it shines as if it had just rolled off the production line. A number of features are immediately apparent approaching the aircraft.

Firstly, the high degree of sweepback of the wings – a sure indicator of an aircraft designed for speed as the wing seeks to increase its critical Mach number. The Citation X wing has 37 degrees of sweepback, the most of any business jet and even greater than the F-86 Sabre jet fighter. Its tailplane, mounted atop the fin, also possesses a high degree of sweep at 42 degrees.



PLENTIFUL POWER The aft mounted engines deliver nearly 13,500lb (60kN) of thrust between them, and have a diameter equal to the original Citation 500's fuselage.

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The two impressive Rolls-Royce AE3007C1 powerplants are fully FADEC and rear mounted, with their noise footprint being released into the airflow aft of the passenger cabin. The proportion of these engines to the overall aircraft size immediately gets one thinking of power-to-weight ratios. From the rear a substantial narrowing of the fuselage also lies aft of the cabin as the fuselage tapers towards the tail. This curvaceous 'area rule' design feature serves to reduce the drag that is created between the fuselage and the engine nacelles.

On closer inspection are tell-tale signs of the aircraft's nature. The door has dual pressurisation seals, including a fail-safe 'passive' seal, to meet its certification requirements to 51,000ft. An additional acoustic seal is also evident to keep cabin noise to a minimum and with a V_{mo} of 350 KIAS above 8000ft, there can be quite an amount of air rushing by. Likewise, the nose locker doors housing the integrated avionics computers and other vital systems are robustly constructed to guard against bird strikes at such speeds.

There are also subtle indicators of its pedigree. The wing is not only highly swept, it is very clean. There are no boundary layer energisers or other aerodynamic enhancements, indicating that the designers 'got it right' in the design phase.

SETTLING IN

Sliding into the left hand seat of the Citation X is amply assisted by a large handle on the central windscreen pillar. To my right is senior Citation pilot Jeff Brollier from Wichita, who is tasked with guiding us safely between Essendon and Adelaide today. For this aircraft, the 350nm sector is a short hop and we are planned at a mere

36,000ft. Jeff explains that it is sectors such as Sydney to Perth where the Citation X can really display its true form.

With the ability to climb directly to 41,000ft at maximum takeoff weight and subsequently cruise in the realm of 0.9 Mach, this business jet can make inroads into the strong headwinds that blow from the west in the form of jetstreams. On the other side of the ledger, Jeff has seen

FAST GLASS Five LCD screens dominate the flightdeck.





GOT IT RIGHT The wing is not only highly swept, it is very clean.

ground speeds in excess of 700kt when flying with the wind!

For today's sector, Jeff has topped both wing tanks to a total of 4000lb (1800kg) in each wing, well in excess of requirements for the 50 minute flight. This will allow an insight into the aircraft's handling at more realistic weights.

As one would expect, the passenger cabin is fantastically appointed. However, there is also an overwhelming sense of comfort from a pilot's perspective. Finding the correct seat position is almost instinctive and the layout of the instrument panel and centre pedestal are ergonomically friendly. The panel is dominated by five central full colour screens displaying flight information and engine data. Outboard of these lie each pilot's audio selector panel, while the centre pedestal is home to dual flight management CDUs and nav/comm units.

NEED FOR SPEED The Mach speed indication in green at the bottom of the grey vertical strip shows 0.903M as the Citation nudges towards the speed of sound.



Central on the pedestal is the throttle quadrant and speedbrake. Sitting further back than they are found on larger jet transports, the thrust lever position is quickly assimilated and is reminiscent of the location and feel of a short gear shift in a sports car, which is well in keeping with the nature of the Citation X.

TAKING FLIGHT

Engine start is a very straightforward process that has both engines running in a minimum of time. From our position on the ramp, a tight left turn is called for and the Citation makes it easily with more turning ability available through the small nosewheel steering 'tiller' located on the side pedestal. The aircraft manoeuvres along the taxiways with a minimum of effort and its tendency to go fast is not limited to the flight envelope, though the very effective carbon brakes keep this in check.

Today we are taking off at 13,600kg, 2725kg below MTOW. The speeds for the standard flap takeoff are V1 114, Vr 117 and V2 125. As the aircraft is not equipped with autothrottle, the thrust levers are simply 'stood up' and set to the correct detent for takeoff. What comes next is one of the most pilot-pleasing aspects of the takeoff sequence – a rapid acceleration that manifests as a 'kick in the pants'. For all of its looks of speed and power on the ramp, the first application of thrust lets the pilots know that this aeroplane is built for looks and speed. Rotation is upon us quickly and I rotate into the flight director as the Citation X heads for the skies.

The feel of the aircraft in the rotation and subsequent climb is heavier than one would expect for an aircraft of this size, but this is a positive quality. Far from being a 'twitchy' sports car, it has a very stable feel and it becomes obvious from the very first

turn that the aircraft is particularly smooth in the rolling plane. This must all convert to a smoother ride in the passenger cabin.

The controls are very well harmonised and deliver just the rate of roll that a pilot is expecting for the input exerted on the control column. This is facilitated by a combination of aileron and staged inboard and outboard spoiler deflection. The mix is just right and provides one of the sweetest roll authorities a pilot could hope for.

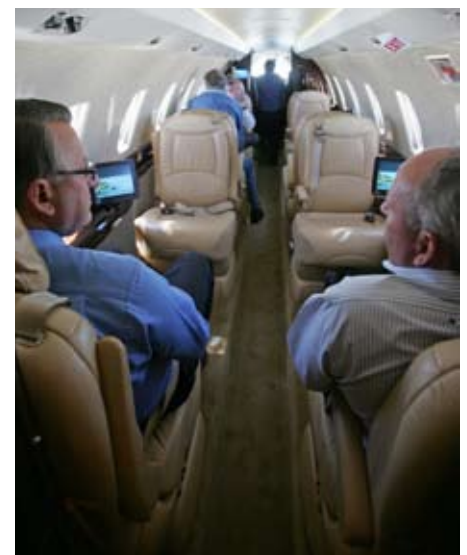
On initial climb out, the aircraft sped away at a rate in excess of 3000ft/min through some low level turbulence. At 250kt, this was well below the approved maximum penetration speed of 300kt/0.9 Mach. Above 10,000ft and accelerating through smooth air the Citation X was an absolute pleasure to hand fly.

Passing 30,000ft and closing in on 0.9 Mach, the Citation maintained 2500ft/min burning 3000lb (1360kg)/hour. Interestingly, the initial fuel burn moves the centre of gravity forward before moving aft in the latter stages.

With the autopilot now engaged the aircraft completes the climb sequence and levels off at 36,000ft, requiring the thrust levers be set to the cruise detent. Optimum cruise speed is around 0.85 Mach, though today we are now cruising at 0.9 Mach with a resultant true airspeed of 523kt and a fuel flow of 2700lb (1225kg)/per hour. Failure to pull the thrust levers back to cruise thrust would seemingly result in an overspeed without too much trouble. It is at these altitudes that the aircraft's efficiency shines. At 51,000ft the Citation X can maintain 0.85 Mach and sip a mere 1200lb (545kg) per hour.

For all of this impressive performance, the aircraft always gives an impression of being a very stable platform. It is both friendly to pilots and ideal for the eight passengers who may be seated in the cabin.

FAST COMFORT The Citation X's cabin typically seats eight.





DANGLING DUNLOPS The X features dual wheeled main and nose landing gear.

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GETTING THERE

Established in the cruise, we have a chance to program the planned arrival into Adelaide. I take the opportunity to appreciate the excellent visibility from the cockpit and absorb the array of information on offer. Jeff consults his electronic flightbag and programs the STAR for runway 23 at Adelaide. The flight management system offers both lateral and vertical navigation with the ability to meet en route constraints. The map display offers a 'heading up' orientation that can be presented in a number of formats. The primary flight display presents altitude and speed on tape displays, either side of the electronic attitude indicator. There is a myriad of functions on offer, though the ability to choose the flight director as 'bars' or 'cross-hairs' is an option that will make any pilot feel at home.

At top of descent, as indicated by the VNAV system, we pitch in and thrust is reduced initially to around 70 per cent N1, leading to a changeover into 340kt. The air noise throughout the descent is pleasantly comfortable for such a high speed descent. As we continue the descent, the thrust is manually managed to maintain the desired speed, of which this aircraft seems to have a heap to spare.

One of the challenges of flying high speed aircraft is slowing them down. To assist with this the Citation X is fitted with very effective speedbrakes. It does not have a noticeable 'rumble' or pitching moment associated with its deployment, nor does it adversely affect the roll qualities of the aeroplane. Furthermore, it is still effective below 250kt where a number of speedbrakes become little more than 'rumble sticks'.

Approaching the terminal area, the leading edges and up to flap 5 can be deployed up to 250kt. Coupled with the speedbrakes, Cessna has provided a very manageable aeroplane when it comes to leaving the realms of high speed flight and returning to the world of mere mortals.

Intercepting the ILS for runway 23 at Adelaide, we continue to manage the landing gear and remaining flaps to flap 30 and configure for landing. Approaching with a Vref of 117kt, the speed almost seems too slow for such a thoroughbred. In the slot on approach, the aeroplane maintains the stability and appropriate responsiveness it has demonstrated throughout the flight.

Crossing the threshold, the thrust levers are retarded and the body angle rotated to the flaring attitude. Just as touchdown approaches, on earlier advice from Jeff, I relax the back pressure just slightly and the Citation X arrives quite respectfully.

Speedbrakes and reverse thrust are deployed in that order and we decelerate smoothly as Jeff comes on the brakes with me to prove just how effective the carbon

brakes are at bringing the aircraft to a halt. Clear of the runway, we taxi to our parking bay and shutdown the aeroplane with a sequence that is even simpler than startup.

LASTING IMPRESSIONS

There is no doubt that the Citation X has come a long way from the Citation's first steps decades ago. What Cessna has been able to deliver is an aircraft with unrivalled performance in its class in the high speed envelope through perceptive design. But this aircraft does more than just meet the numbers.

It provides tremendous comfort in the cabin and satisfying handling for those called to fly it. In spite of its high speeds, it is not 'slippery' to manage. It handles well at both ends of the speed envelope and has adequate systems for the aircraft to transition between the two spectrums without undue workload.

The Citation X is the complete package, allowing both crew and passengers to arrive in style, in comfort and in time. ■

UNMATCHED No other civil aircraft can operate transcontinental sectors as quickly as the Citation X.

